

U.S. Patent Application Serial No. 10/565,156
Response to OA dated November 14, 2008

AMENDMENTS TO THE SPECIFICATION:

Please amend the paragraphs beginning on page 5, line 21 as follows:

Fig. 5 is a schematic sectional view showing a state in which the probe scrubs an electrode;

[[and]]

Fig. 6 is a schematic sectional view showing a variation in design of the probe, in which (a) is a schematic sectional view showing a case in which an arc-shaped deformation part is provided, and (b) is a schematic sectional view showing a case in which a triangle pyramid-shaped deformation part is provided[[.]];

Fig. 7(a) is a three-dimensional view showing the contact part of the probe according to Embodiment 1, and Fig. 7(b) is a three-dimensional view showing a state in which the same contact part scrubs an electrode; and

Fig. 8(a) is a three-dimensional view showing the contact part of the probe according to Embodiment 2, and Fig. 8(b) is a three-dimensional view showing a state in which the same contact part scrubs an electrode.

Please amend the paragraph beginning on page 7, line 10 as follows::

The contact part 110 comprises a base part 111 whose tip end is sharply pointed and an expansion part 111a (that is, a junction part) having a rectangular shape as viewed from longitudinal section (that is, almost rectilinear shape) and integrally and longitudinally along a widthwise end 111 of the base part. The expansion part 111a is formed of a material having a thermal expansion

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coefficient higher than that of the base part 111. That is, the contact part 110 is bimetal. According to the contact part 110, the base part 111 is formed of invar having a thermal expansion coefficient of 0.4×10^{-6} and the expansion part 111a is formed of brass having a thermal expansion coefficient of 20×10^{-6} so that it can function as bimetal at an environmental temperature of 85 to 125°C as shown in Fig. 2.

Please amend the paragraph beginning on page 7, line 24 as follow::

The contact part 110 of the probe 100 is manufactured by bonding the expansion part 111a along the widthwise end 1111 of the base part 111 using various kinds of well-known plating techniques or bonding techniques.

Please amend the paragraph beginning on page 8, line 7 as follows:

As described above, the probe 100 has a constitution in which the expansion part 111a having the almost rectangular shape as viewed from the longitudinal section is bonded along the longitudinal direction at the widthwise end 1111 of the base part 111 of the contact part 110. That is, the contact part 110 is bimetal. Thus, the probe card comprising the probe 100 is mounted on a prober (not shown). Meanwhile, when the prober is operated in a state the object to be measured is set on the heating means and the environmental temperature is attained at 85 to 125°C by the heating means, the contact part 110 of the probe 100 relatively comes close to the object to be measured and comes in contact with the electrode 10 of the object to be measured perpendicularly. In this state,

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when the contact part 110 of the probe 100 comes close to the electrode 10 of the object to be measured more closely and overdriving is performed, each of the base part 111 and the expansion part 111a of the contact part 110 is thermally expanded by the heat of the environmental temperature transferred through the electrode 10 of the object to be measured, so that the contact part 110 is curved toward a direction g of the base part 111 because the base part 111 has a smaller thermal expansion coefficient (that is, the contact part 110 is deformed in a direction almost perpendicular to the longitudinal direction of the base part 111 (refer to Fig. 2)). When the contact part 110 is deformed, the tip end 1112 of the contact part 110 scrubs the electrode 10 of the object to be measured. Thus, since an insulation film such as an oxide film attached on the electrode 10 can be scrubbed out, contact resistance between the contact part 110 and the electrode 10 can be lowered without pressing the contact part 110 against the electrode 10 with a high contact pressure like the conventional example. Thus, even when the probe 100 is miniaturized, stable electric conduction between the contact part 110 of the probe 100 and the electrode 10 of the object to be measured can be implemented without causing a contact defect.

Please amend the paragraph beginning on page 11, line 9 as follow: :

The contact part 210 comprises a base part 211 whose tip end is sharply pointed and a deformation part 211a (that is, a junction part) having a rectangular shape as viewed from longitudinal section and integrally provided in a longitudinal direction at along widthwise end 2111 of the base part 211. The base part 211 is formed of a material which can be elastically deformed,

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such as tungsten. Meanwhile, the deformation part 211a is formed of a shape memory alloy which is contracted in a longitudinal direction of the base part 211 at 80 to 90°C and returns to its original length at 50 to 60°C. Examples of this shape memory alloy include titanium-nickel (Ti-Ni) which is contracted at 85°C, and the like.

Please amend the paragraph beginning on page 11, line 21 as follows:

The contact part 210 is manufactured by bonding the deformation part 211a to the widthwise end 2111 of the base part 211 in the width direction by a well-known resistance welding technique. As another bonding method, a diffusion welding, surface modifying technique or the like can be used.

Please amend the paragraph beginning on page 12, line 5 as follows:

As described above, the probe 200 has a constitution in which the deformation part 211a which can be contracted in the longitudinal direction of the base part 211 is bonded to the widthwise end 2111 of the base part 211 of the contact part. Thus, the probe card comprising the probe 200 is mounted on a prober (not shown). Meanwhile, when the prober is operated in a state in which the object to be measured is set on the heating means and the environmental temperature is attained at 85°C or more by the heating means, the contact part 210 of the probe 200 relatively comes close to the object to be measured and comes in contact with the electrode 10 of the object to be measured perpendicularly. In this state, when the contact part 210 of the probe 200 comes close to the

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electrode 10 of the object to be measured more closely and overdriving is performed, the deformation part 211a of the contact part 210 is contracted in the longitudinal direction of the base part 211 by the heat of the environmental temperature transferred through the electrode 10 of the object to be measured, so that the contact part 210 is curved (that is, the contact part 210 is deformed in a direction a almost perpendicular to the longitudinal direction of the base 211 (refer to Fig. 5)). When the contact part 210 is deformed, the tip end 2112 of the contact part 210 scrubs the electrode 10 of the object to be measured. Thus, since an insulation film such as an oxide film attached on the electrode 10 can be scrubbed out, contact resistance between the contact part 210 and the electrode 10 can be lowered without pressing the contact part 110 against the electrode 10 with a high contact pressure like the conventional example. Thus, even when the probe 200 is miniaturized, stable electric conduction between the contact part 210 of the probe 200 and the electrode 10 of the object to be measured can be implemented without causing a contact defect.